SEMIANNUAL TECHNICAL REPORT FOR RESEARCH GRANT FOR 1 JAN 93 TO 30 JUN 93

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Grant Title:	Exploitation of Cyclostationarity for Signal-Parameter Estimation and System Identification
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PROGRESS

There are three particularly notable accomplishments during the present reporting period. The first is the development of a substantial generalization of our SCORE algorithm for blind adaptive spatial filtering to the Programmable Canonical Correlation Analyzer (PCCA) which can exploit any of a number of signal properties to distinguish between signals of interest (to be beamformed on) and signals not of interest (to be nulled out). The second is a new algorithm for blind adaptive channel equalization for PAM and digital QAM signals, and for either single or multiple channels. These two developments are briefly described in [2] and a particularly attractive special case of the blind equalization algorithm for single channels is briefly described in [1]. The substantial performance improvements (acceleration of convergence) attainable with multicycle SCORE, which is one example of PCCA, are described in [3]. The substantial performance improvements (lower BER and lower admissible input SNR) of our blind channel equalizer relative to Tong, Xu, and Kailath's equalizer are described in [2].

The third notable achievement is the completion of the edited volume *Cyclostationarity in Communications and Signal Processing,* [4] being published by IEEE Press this Fall. A table of contents of this volume is enclosed.

In addition, we have continued our work, from earlier periods of support under this contract, on the application of blind adaptive spatio-temporal filtering to mobile cellular radio. We have proposed and simulated a new system concept that provides more capacity than any of its competitors [5]. We shall continue to evaluate this new system design while seeking refinements to further improve performance and/or reduce complexity.

PAPERS AND CHAPTERS PUBLISHED OR IN PRESS, OR SUBMITTED

1. W. A. Gardner, "An Introduction to Cyclostationary Signals," Chapter 1 in Cyclostationarity in Communications and Signal Processing, IEEE Press, 1993. (in press)

2. S. V. Schell, "An Overview of Sensor Array Processing for Cyclostationary Signals," Chapter 3 in Cyclostationarity in Communications and Signal Processing, IEEE Press, 1993. (in press)

3. S. V. Schell and W. A. Gardner, "Maximum-likelihood and common factor analysis-based blind adaptive spatial filtering for cyclostationary signals," Proceedings of 1993 IEEE International Conference on Acoustics, Speech and Signal Processing, pp. IV-292 - IV-295. (published)

4. W. A. Gardner, ed., *Cyclostationarity in Communications and Signal Processing*, IEEE Press, 1993. (in press)

5. S. V. Schell and W. A. Gardner, "Blind adaptive antenna arrays in cellular communications for increased capacity," Proceedings Third Virginia Tech. Symp. on Wireless Personal Communications, Kluwer Academic Publisher. (in press)

6. S. V. Schell and W. A. Gardner, "Programmable common term analysis: A unifying framework for blind adaptive spatial filtering," Twenty-Seventh Annual Asilomar Conference on Signals, Systems and Computers, November 1-3, 1993. (submitted)